

Rejuvenation Instructions

#602 – Small Diameter Cables – iUPR



This NRI covers the following:

- The iUPR injection process for small diameter, URD sized cables.
- How to set up injection equipment.

Trademarks: <http://www.novinium.com/trademarks/>

Patents: <http://www.novinium.com/patents/>



WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

Table of Contents

- Installing Equipment 2
 - 1. Attach Craft Tags..... 2
 - 2. Feed tank and fluid injection cap..... 2
 - 3. Receiver tanks..... 4
 - 4. Pressurize feed tanks..... 4
- Pre-Injection Check 5
 - 1. Check for leaks..... 5
- Recording Tank Levels..... 5
 - 1. Record the injection start time and feed tank level..... 5
- Starting the Injection 5
 - 1. Check the flow..... 5
 - 2. Flush water and other fluids..... 5
 - 3. During the injection..... 6
- Estimating Fluids 7
 - 1. Estimate the current fluid supplied..... 7
 - 2. Estimate the time for fluid to arrive..... 8
- Fluid Arrival 8
 - 1. Flush the cable..... 8
- Recording Tank Levels..... 9
 - 1. Record the injection end time and feed tank level..... 9

Installing Equipment

1. Attach Craft Tags

The Novinium certified craftsman must attach their craft tag onto each component body. Secure the tag with tape to ensure it will not move.



Figure 1: Craft tag placed on the component.

2. Feed tank and fluid injection cap.

- a. Close **all** the valves on the feed tank and the compact CO₂ kit.
- b. Connect the 6ft length of 1/4" OD x 0.05" ID tubing to the fluid injection cap (FIC). It can be shortened in the field.



Figure 2: The FIC.

- c. The feed tank comes with a ball valve, but a second valve can be placed in-line with the FIC.
 - Tanks are equipped with either quick disconnect (QD) or JACO fittings.
 - JACO fittings have shown to work better in colder temperatures.



Figure 3: JACO and QD fittings.

- d. Connect the tubing from the FIC to the feed tank's injection port (colored red).



Figure 4: Connect the FIC to the feed tank.

- e. Using ¼" tubing, connect the compact CO₂ kit to the feed tank's gas port (colored purple).
- An in-line gauge can be added to help verify pressure sent to the feed tank.



Figure 5: Connect the compact CO₂ kit to the feed tank.

- f. Verify that the reticulated flash preventer (RFP) has been installed in the injection elbow and has been pre-wetted.
- g. Install the FIC onto the injection elbow.

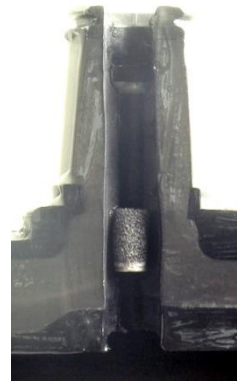


Figure 6: RFP in the injection elbow.

3. Receiver tanks.

- a. Draw a full vacuum into an empty UP-RCVR tank.
- b. Make sure the UP-RCVR tank's ball valve is closed.
- c. Connect a FIC to the UP-RCVR tank with the 6' length of 1/4" OD x 0.05" ID tubing. It can be shortened in the field.
 - Even though the UP-RCVR tank comes with a ball valve, a second valve can be placed in-line with the FIC, similar to the feed end.
- d. Verify that the RFP has been installed in the receiving elbow and has been pre-wetted.
- e. Install the FIC onto the injection elbow.
- f. Open all ball valves on the receiving end.
- g. The vacuum in the UP-RCVR tank will now drop as it pulls air from the cable.
- h. Pull the vacuum until the tank maintains a full vacuum.
- i. Check the tank for any leaks.
 - If any leaks are found, swap the UP-RCVR tanks for one that works or perform field repairs on the tank.
 - Contact Supply Chain for an exchange or if you need help.

4. Pressurize feed tanks.

- a. Slowly pressurize the feed tank to the **adjusted injection pressure (AIP)** determined from the pre-injection flow and pressure tests.
 - **Do not exceed 25psi for iUPR injection.**
 - For more information, refer to **NRI 352 Injection Pressure Selection**.
- b. Read the pressure on both the inline gauge and tank gauge.
 - The two readings should be close to each other.

- c. Check the tank for any leaks.
 - If any leaks are found, relieve all pressure immediately and fix the leak.
 - A pressure relief valve prevents hardware operation above the design pressure.
 - Do not tamper with the pressure relief valve.

Pre-Injection Check

1. Check for leaks.

- a. Before sending fluid straight to the cable, make sure each part of the injection assembly is leak-free.
 - If any leaks are found in the following process, close all valves, relieve pressure, and fix the leak.
- b. Double-check that **all** the valves on the feed tank, tubing, and gas tank are closed.
- c. Open the valve on the feed tank's injection port. This will send fluid to any ball valves between the feed tank and the FIC.
- d. Wait 3 to 4 seconds and watch for leaks.

Recording Tank Levels

1. Record the injection start time and feed tank level.

- a. Record the feed tank's starting fluid level in **millimeters** (mm) from the bottom of the meniscus in the sight gauge.
- b. Record the time the injection was started.
- c. Enter this information into Knomentous.

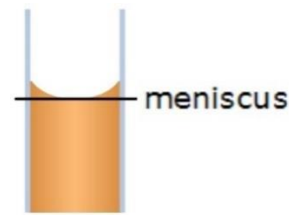


Figure 7: Read the level from the bottom of the fluid meniscus.

Starting the Injection

1. Check the flow.

- a. Open the valve to the FIC.
- b. Watch for any leaks from the FIC or the injection elbow.
- c. Verify flow into the cable by watching the sight gauge for a drop in level.

2. Flush water and other fluids.

- a. If water or other fluids are in the cable, it may be necessary to empty the UP-RCVR tank multiple times during injection.

- b. To measure the fluid flushed, transfer all fluids to a graduated flush bottle.



Figure 8: Transfer all fluids from the UP-RCVR tank to a graduated flush bottle.

- c. Let the bottle sit for a few minutes.
 - Water and other fluids should separate if left still.
- d. Read the water and fluid levels on the side of the bottle.
- e. Record all fluid and water flush and enter the total volume into Knomentous.

3. During the injection.

When the injection appears leak-free and stabile, the crew can leave to begin injection at another location.

- a. Secure the feed and CO₂ tanks in the enclosure or near the termination.

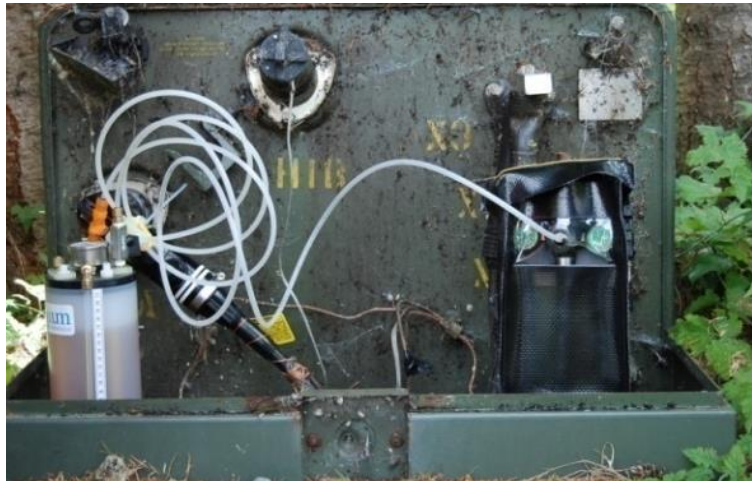


Figure 9: iUPR equipment placed inside the enclosure.

- If the feed tank must be placed horizontally, keep the sight gauge pointed up with the top of the tank elevated at least 3 inches above the bottom.
- CO₂ tanks **MUST** be upright.



Figure 10: iUPR feed tanks placed at an angle.

- b. Electrically isolate metallic portions of the tanks from energized components and grounds.
- c. The first foot of tubing attached to the cable must never contact any ground or other phase conductor.
- d. Minimize tubing contact with grounds beyond the first foot.
- e. The feed and receiver tanks and CO₂ tank are all protected or non-conductive.
 - They can be left inside the transformer box or onsite for continuous injection.
- f. The cable can be re-energized now.
- g. Return periodically to check on the status of the feed and receiver tanks.
- h. Maintain the 25" Hg. vacuum in the receiver tank each time you check.

Estimating Fluids

1. Estimate the current fluid supplied.

- a. Take the current fluid level in **millimeters** (mm).
- b. Subtract the current level from the starting level.

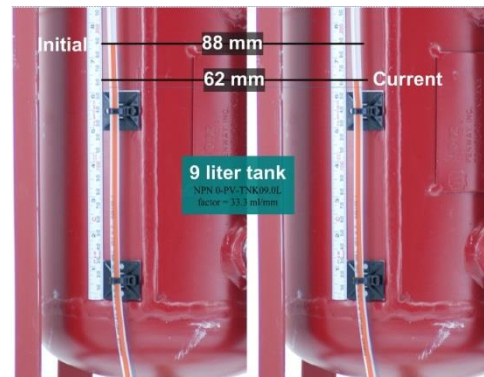


Figure 11: Find the start and current fluid level.

- c. To find the total fluid volume in cubic centimeters (cc), multiply the difference by the tank factor for the feed tank being used.
 - Tank Factors can also be found on a sticker on the tank or in **NRI 412**.
 - **1.5 Liter Tank Factor: 7.42 cc/mm**



Figure 12: Tank factor sticker.

2. Estimate the time for fluid to arrive.

- a. Find how much time has passed since the injection began.
- b. Use **NRI 302 The Cable Table** to calculate the target fluid amount the cable will take in millimeters of tank height.
- c. Divide the calculated target by the millimeters of fluid currently injected into the cable.
- d. Multiply this number by the amount of time the injection has currently taken.
- e. This is the estimated amount of time left for injection.

Fluid Arrival

1. Flush the cable.

- a. Injection will continue until fluid fills the cup inside the UP-RCVR tank, where it automatically stops.
 - The cup holds 14cc of fluid.
- b. If the UP-RCVR tank fills with water or foreign fluid, disconnect and drain the UP-RCVR tank into a graduated flush bottle.
 - Record this amount into Knomentous.
- c. When the UP-RCVR tank is filled with Novinium fluid, the injection is complete.



Figure 13: A filled UP-RCVR tank.

- d. Close the UP-RCVR tank's valves and swap it with a UP-REL bottle for 60 seconds to relieve any pressure in the cable.
 - Record this amount of fluid into the "Flush" field in Knomentous.



Figure 14: QD UP-REL bottle.



Figure 15: JACO UP-REL bottle.

Recording Tank Levels

1. Record the injection end time and feed tank level.

- a. Record the feed tank's ending fluid level in **millimeters** (mm) from the sight gauge.
- b. Record the time the injection ended.
- c. Enter this information into Knomentous.
- d. Enter the amount of fluid flushed from the cable into the "Flush" field.
 - If the UP-RCVR tank was fully filled, type "1". Knomentous equates this to 14cc.
 - If more fluid is flushed than just in the UP-RCVR tank, change the receiver tank in Knomentous to one of the graduated flush bottles and enter the volume of fluid flushed from the cable.
- e. Enter the data into Knomentous.